

## METHOD FOR JOINING FRAME MEMBERS

### BACKGROUND OF THE INVENTION

#### 1. Field of the invention

5 The present invention relates to a method for joining frame members.

#### 2. Prior Art

A Vehicle body frame is composed of frame members, such as a front pillar and a roof side rail. In this vehicle body frame, each of the frame members is joined in a position where each member comes together. And there are some methods for joining members in such position, as below.

In one of the joining methods, as shown in Fig. 4A, each of the frame members was joined by welding, wherein an intricate configuration for fitting the frame members together is formed on one end part of the frame members 51, 52 and 53, respectively.

In another method for joining each member, as shown in Fig. 4B, each of the frame members is joined by using the joining member 57. And in this joining member 57, there are provided with engaging holes 57A, 57B and 57C, where each of the frame members 54, 55 and 56 will be engaged in, 20 respectively.

And in this method, each of the frame members is joined in the following procedure; First, engaging one end part of the frame member 54 into the engaging hole 57A, and engaging one end part of the frame member 55 into the engaging hole 57B, and engaging one end part of the frame member 56 into the engaging hole 57C, and finally weld the engaged part of joining member 57 with each end part of the frame members.

One example of this case is disclosed in a Japanese Laid-Open Patent publication 05-65078.

However, there have been pointed out some problems in these conventional methods. For example, in the method as shown in Fig. 4A, it  
5 needs to form the intricate configuration at one end part of each of the frame members 51, 52 and 53, respectively. And in the method as shown in Fig. 4B, it needs further process to prepare the joining member 57 by means of mold, in addition to preparation of the frame members 54, 55 and 56.

Also, in the conventional methods, each of the frame members is joined by means of welding, therefore, each frame is apt to be deformed by the heat generated in the process of welding. As a result, precision of joined part is not maintained after welding. This defect is particularly observed, when the frame members were prepared with aluminum alloy.  
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#### SUMMARY OF THE INVENTION

This invention has been made to solve the above problems. And it is therefore an object of the present invention to provide a method for joining frame members, wherein frame members are joined without forming  
20 the intricate configuration on the end part of the frame members. The frame members can be joined without using the joining members.

According to the first aspects of the present invention, there is provided a method for joining the frame members. The frame members are joined, by wrapping up the connecting part of the frame members in cast metal, after fitting the frame members into a mold.  
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In the first aspect of the present invention, each of the frame

members is joined, by wrapping up the connecting part of the frame members in cast metal, after setting the frame members in a mold. Therefore, each of the frame members can be joined without forming the intricate configuration on an end part of the frame members, without using  
5 the joining member. Frame members are joined without welding procedure.

Manufacturing process is, thus simplified. Each of the frame members is joined with a superior positional precision without using specific part, because, each of the frame members are joined by wrapping up the connecting part in cast metal. Moreover, if an irregularity of the shape is occurred at the end part of the frame members when casting, the irregularity of the shape can be absorbed within a mold.

Further, since each of the frame members is joined without welding procedure, the problem, that the shape of each frame member is deformed by the heat generated in welding procedure, can be solved.

According to the second aspect of the present invention, there is provided a method for joining the frame members, wherein each frame member is made of aluminum alloy.

The method for joining frame members of first aspect of the present  
20 invention, wherein deformation of the frame members caused by the heat generated in welding is avoided. Therefore, the present invention's effect becomes more effective when the aluminum alloy, which is easily deformed by heat, is applied as a frame member.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig 1 is a partial cross-sectional view of the joining structure of

frame members according to the present invention.

Fig 2 is an explanation view indicating a process for joining the frame members according to the present invention.

Fig 3 is partially chipped side view of another example of the joining  
5 structure of frame members according to the present invention.

Fig 4 A and Fig 4 B are perspective views of illustrating joining frame members in prior art according to the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiment of the present invention will now be described by referring to the accompanying drawings. Fig.1 is a side view of joining structure of the frame members, wherein each of the frame members is joined according to the present invention.

In this embodiment, junction part located in the front part of a front door of a car will be described as an example of joining structure of frame members.

As shown in Fig. 1, in the front part of a front door of a car, the joining structure 1 of a frame member is formed. In this joining structure 1, each end part of a sash 2, a side frame 3 and a vertical frame 4 are wrapped in cast metal, and the sash 2, the side frame 3 and the vertical frame 4 are joined by a casted joining member 5.  
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The frame members are composed of the sash 2, the side frame 3 and the vertical frame 4 which are used in the joining structure 1, and are molded by extrusion of aluminum alloy. Each the sash 2, the side frame 3  
25 and the vertical frame 4 are obtained by plane-cutting of the end part of frame which is molded by extrusion. So, the each end part of the frame

members, such as the sash 2, the side frame 3 and the vertical frame 4, have any intricate configuration.

Further, the sash 2 is obtained by bending the frame which is molded by extrusion.

5       The casted joining member 5 is obtained by cooling the molten metal, which was filled into the mold 6, as shown in Fig 2A.

Therefore, the casted joining member 5 is formed having the same shape as an inside configuration of the molten metal pouring member which is formed inside the mold 6.

10     Furthermore, the mold 6 has the first fitting groove 11, the second fitting groove 12 and the third fitting groove 13. Wherein, the first fitting groove 11 has a right size for fitting the sash 2, the second fitting groove 12 has a right size for fitting the side frame 3 and the third fitting groove 13 has a right size for fitting the vertical frame 4. In this mold 6, each members (the sash 2, the side frame 3 and vertical frame 4) is fitted keeping close contact with the fitting grooves (11 12 and 13).

Next, a method for joining the frame members will be described. Fig 2 is an explanation view indicating a process for joining the frame members.

20     First, as shown in Fig 2A, fit the sash 2 into the first fitting groove 11, which is formed on the mold 6. In this case, the tip part of the sash 2 is fitted into the mold 6 and protrudes suitable length through the first fitting groove 11 toward inside of the mold 6.

Next, fit the side frame 3 into the second fitting grooves 12, and 25 further fit the vertical frame 4 into the third fitting grooves 13. The tip end of both the side frame 3 and the vertical frame 4 protrude suitable

length through the first fitting groove 11, 12 toward inside of the mold 6. Consequently, the sash 2, the side frame 3 and the vertical frame 4 are arranged to the mold 6.

As shown in Fig 2B, after fitting the sash 2, the side frame 3 and the vertical frame 4 into grooves 11, 12 and 13 respectively. Pour the molten metal into the mold 6 until the sash 2, the side frame and the vertical frame 4 are completely covered with the molten metal. And after the molten metal is poured into the mold 6, cooling the molten metal in a predetermined time. And after the molten metal becomes harden, remove the mold 6. Consequently, the casted joining member 5 is obtained wherein each end pert of the sash 2, the side frame 3 and the vertical frame 4 are joined by wrapped up in cast metal

Thus, with the formation of the casted jointing member 5, the jointing structure 1 is also formed, by wrapping up sash 2, side frame 3 and vertical frame in cast metal

Therefore, the method for joining the frame members in this invention, the joining structure 1 is formed simultaneously with the formation of the casted joining member 5.

Thus, it is not necessary to manufacture the joining member independently, when this invention's method is applied for construction of the frame member, by joining the sash 2, the side frame and the vertical frame.

These frame members, such as the sash 2, the side frame 3 and the vertical frame 4, are obtained by plane-cutting the end part of frame, which is molded by extrusion. So, the frame members are obtained easily.

Also, each of the frame members is joined in the mold, wherein each

of the frame members are wrapped in cast metal, so each of the frame members are joined with superior positional precision without using specific parts.

Furthermore, each of the frame members is joined without welding.

- 5 Thus, manufacturing process is simplified, and manufacturing cost is reduced.

The present invention is disclosed with the preferable embodiment. However, the invention is not restricted to this embodiment.

This invention's method can be applied for the pillar connecting part of the body frame in a car C, as shown in Fig 3.

In the joining structure 20, as shown in Fig. 3, each of the frame members is joined by using this invention's method, wherein said frame members are composed of a front pillar 21, a rear pillar 22, a center pillar and a side sill.

And in this joining structure 20, the first casted joining member 25 which connects the front pillar 21, the rear pillar 22 and the center pillar together, and the second casted joining member 26 which connects the center pillar 23 and the side sill 24 are used.

This invention's method also can be applied to these the first casted jointing member 25 and the second casted jointing member 26.

And in this embodiment, aluminum alloy is used as the frame member. The element employed in the frame member is not restricted to aluminum alloy, but such as iron, another nonferrous metals and plastic resins can be used as a frame member.

25 The method for joining frame members of first aspect of the present invention, each frame member can be joined without forming the intricate

configuration on the end part of the frame members. Each of the frame members can be joined without using the joining member and without welding process. So, the manufacturing process for joining frame members can be simplified.

- 5       The method for joining frame members of second aspect of the present invention, this invention's method can avoid any deformation of the frame members, wherein aluminum alloy, which is easily deformed by heat, is employed as frame members.